

LISTING OF CLAIMS

1 (previously presented): A chemical liquid injection system including: a liquid syringe having a piston member being inserted slidably into a cylinder member filled with a liquid, and a chemical liquid injector having a liquid injection mechanism for relatively moving the cylinder member and the piston member of the liquid syringe exchangeably mounted on the chemical liquid injector to inject the liquid into a patient, said liquid injections mechanism contains a detector for obtaining a pressure applied to the piston member; wherein

said liquid syringe further comprises an RFID (Radio Frequency Identification) chip having various types of data recorded thereon, said various types of data including identification data for said liquid syringe, an inner diameter of the cylinder member and a value of pressure resistance of the liquid syringe, the RFID chip being mounted on said liquid syringe, and

said chemical liquid injector further comprises:

an RFID reader for obtaining the various types of data recorded on the RFID chip; and

operation control means configured to perform a predetermined operation including controlling the operation of the liquid injection mechanism such that the detected pressure does not exceed the value of pressure resistance in accordance with at least some of the various types of obtained data, and wherein said operation control means comprises data storing means for storing predetermined check conditions including identification data of usable liquid syringe, data collating means for collating the stored check conditions with the various types of data obtained from said RFID chip, data accumulating means for storing the identification data, and alarm outputting means for outputting a check alarm if the identification data obtained from said RFID chip is not included in the check conditions as a result of the collation, and wherein

said detector obtains the pressure by detecting a stress on the piston member and calculating an injection pressure based on the inner diameter obtained from the RFID chip and the detected stress.

2 (original): The chemical liquid injection system according to claim 1, wherein said chemical liquid injector further comprises data display means for outputting and displaying various types of data, and

said operation control means comprises data holding means for holding the various types of data obtained from said RFID chip and display control means for causing the data display means to output at least some of the various types of held data.

3 (original): The chemical liquid injection system according to claim 2, wherein said chemical liquid injector comprises an injection control unit on which at least the operation control means is mounted and an injection head formed separately from the injection control unit, at least the liquid injection mechanism and the data display means being mounted on the injection head.

4 (original): The chemical liquid injection system according to claim 3, wherein said RFID reader is mounted on the injection head.

5 (previously presented): The chemical liquid injection system according to claim 1, wherein said RFID reader is placed at a position where the RFID reader detects said RFID chip of the mounted liquid syringe in said chemical liquid injector.

6 (original): The chemical liquid injection system according to claim 5, wherein said operation control means controls the liquid injection mechanism to enable its operation only when said RFID reader detects said RFID chip.

7 (previously presented): The chemical liquid injection system according to claim 5, wherein said operation control means places the liquid injection mechanism at an initial position when the completion of injection operation is detected and then the detection of said RFID chip by said RFID reader is finished.

8 (previously presented): The chemical liquid injection system according to claim 1, wherein said operation control means comprises data holding means for holding the various types of data obtained from said RFID chip and injection control means for controlling the operation of the liquid injection mechanism in accordance with at least some of the various types of held data.

9 (original): The chemical liquid injection system according to claim 8, wherein said liquid syringe is of a pre-filled type which is shipped with a contrast medium filled therein as the liquid to be injected into a patient whose diagnostic image is taken by a diagnostic imaging apparatus, said RFID chip of the liquid syringe has a variable pattern set thereon for changing an injection rate of the contrast medium with time, and

said operation control means changes the operation rate of the liquid injection mechanism with time in accordance with the variable pattern.

10 -11 (canceled)

12 (previously presented): The chemical liquid injection system according to claim 1, wherein said liquid syringe has said RFID chip mounted thereon, the fact that the liquid syringe is used once or "used" being recorded as data on said RFID chip, and

said operation control means comprises data recording means for recording the "used" on said RFID chip of the liquid syringe which was mounted and used to perform injection operation, and alarm outputting means for outputting a check alarm when the "used" is obtained from said RFID chip of the liquid syringe.

13 (previously presented): The chemical liquid injection system according to claim 1, further comprising peripheral device for the syringe including a hollow needle-like member inserted into the patient to flow the liquid, an extension tube connecting the needle-like member to said liquid syringe to flow the liquid, and a unidirectional valve inserted into the extension tube to regulate the flow direction of the liquid, and

an RFID chip having various types of data recorded thereon being mounted on each peripheral device for the syringe.

14 (previously presented): The chemical liquid injection system according to claim 1, further comprising peripheral tool for the patient including a wristband put on an arm of the patient and a medical chart on which various types of data about the patient are written, and

an RFID chip having various types of data about the patient recorded thereon being mounted on each peripheral tool for the patient.

15 (previously presented): The chemical liquid injection system according to claim 1, further comprising a liquid warmer for keeping the liquid in the mounted liquid syringe at an appropriate temperature with a heat-retaining mechanism, the liquid warmer being provided separately from said chemical liquid injector,

wherein the liquid warmer comprises:

an RFID reader for obtaining the various types of data recorded on said RFID chip; and

operation control means for performing a predetermined operation in accordance with at least some of the various types of obtained data.

16 (previously presented): A chemical liquid injector in the chemical liquid injection system according to claim 1, comprising:

an RFID reader for obtaining the various types of data recorded on the RFID chip; and
operation control means for performing a predetermined operation in accordance with at least some of the various types of obtained data.

17 (original): A liquid warmer in the chemical liquid injection system according to claim 15, comprising:

an RFID reader for obtaining the various types of data recorded on the RFID chip; and
operation control means for performing a predetermined operation in accordance with at least some of the various types of obtained data.

18 (previously presented): A chemical liquid injection system including: a liquid syringe having a piston member being inserted slidably into a cylinder member filled with a liquid, and a chemical liquid injector having a liquid injection mechanism for relatively moving the cylinder member and the piston member of the liquid syringe exchangeably mounted on the chemical liquid injector to inject the liquid into a patient, said liquid injections mechanism contains a detector for obtaining a pressure applied to the piston member; wherein

said liquid syringe further comprises an RFID (Radio Frequency Identification) chip having various types of data recorded thereon, said various types of data including identification data for said liquid syringe, expiration date of a liquid filled in said liquid syringe, an inner diameter of the cylinder member and a value of pressure resistance of the liquid syringe recorded, the RFID chip being mounted on said liquid syringe, and
said chemical liquid injector further comprises:

an RFID reader for obtaining the various types of data recorded on the RFID chip; and
operation control means configured to perform a predetermined operation including controlling the operation of the liquid injection mechanism such that the detected pressure does not exceed the value of pressure resistance in accordance with at least some of the various types of obtained data, and wherein

said operation control means comprises data storing means for storing predetermined check conditions including the current date and time, data collating means for collating the stored check conditions with the various types of data obtained from said RFID chip, data accumulating

means for storing the identification data and alarm outputting means for outputting a check alarm if the current date and time is after the expiration date as a result of the collation, and

said detector obtains the pressure by detecting a stress on the piston member and calculating an injection pressure based on the inner diameter obtained from the RFID chip and the detected stress.

19 (previously presented): The chemical liquid injection system according to claim 18, wherein said chemical liquid injector further comprises data display means for outputting and displaying various types of data, and

said operation control means comprises data holding means for holding the various types of data obtained from said RFID chip and display control means for causing the data display means to output at least some of the various types of held data.

20 (previously presented): The chemical liquid injection system according to claim 19, wherein said chemical liquid injector comprises an injection control unit on which at least the operation control means is mounted and an injection head formed separately from the injection control unit, at least the liquid injection mechanism and the data display means being mounted on the injection head.

21 (previously presented): The chemical liquid injection system according to claim 20, wherein said RFID reader is mounted on the injection head.

22 (previously presented): The chemical liquid injection system according to claim 18, wherein said RFID reader is placed at a position where the RFID reader detects said RFID chip of the mounted liquid syringe in said chemical liquid injector.

23 (previously presented): The chemical liquid injection system according to claim 22, wherein said operation control means controls the liquid injection mechanism to enable its operation only when said RFID reader detects said RFID chip.

24 (previously presented): The chemical liquid injection system according to claim 22, wherein said operation control means places the liquid injection mechanism at an initial position when the completion of injection operation is detected and then the detection of said RFID chip by said RFID reader is finished.

25 (previously presented): The chemical liquid injection system according to claim 18, wherein said operation control means comprises data holding means for holding the various types

of data obtained from said RFID chip and injection control means for controlling the operation of the liquid injection mechanism in accordance with at least some of the various types of held data.

26 (previously presented): The chemical liquid injection system according to claim 25, wherein said liquid syringe is of a pre-filled type which is shipped with a contrast medium filled therein as the liquid to be injected into a patient whose diagnostic image is taken by a diagnostic imaging apparatus, said RFID chip of the liquid syringe has a variable pattern set thereon for changing an injection rate of the contrast medium with time, and

said operation control means changes the operation rate of the liquid injection mechanism with time in accordance with the variable pattern..

27 (previously presented): The chemical liquid injection system according to claim 18, wherein said liquid syringe has said RFID chip mounted thereon, the fact that the liquid syringe is used once or "used" being recorded as data on said RFID chip, and

said operation control means comprises data recording means for recording the "used" on said RFID chip of the liquid syringe which was mounted and used to perform injection operation, and alarm outputting means for outputting a check alarm when the "used" is obtained from said RFID chip of the liquid syringe.

28 (previously presented): The chemical liquid injection system according to claim 18, further comprising peripheral device for the syringe including a hollow needle-like member inserted into the patient to flow the liquid, an extension tube connecting the needle-like member to said liquid syringe to flow the liquid, and a unidirectional valve inserted into the extension tube to regulate the flow direction of the liquid, and

an RFID chip having various types of data recorded thereon being mounted on each peripheral device for the syringe.

29 (previously presented): The chemical liquid injection system according to claim. 18, further comprising peripheral tool for the patient including a wristband put on an arm of the patient and a medical chart on which various types of data about the patient are written, and

an RFID chip having various types of data about the patient recorded thereon being mounted on each peripheral tool for the patient.

30 (previously presented): The chemical liquid. injection system according to claim 18, further comprising a liquid warmer for keeping the liquid in the mounted liquid syringe at an

appropriate temperature with a heat-retaining mechanism, the liquid warmer being provided separately from said chemical liquid injector,

wherein the liquid warmer comprises:

an RFID reader for obtaining the various types of data recorded on said RFID chip; and
operation control means for performing a predetermined operation in accordance with at least some of the various types of obtained data.

31 (previously presented): A chemical liquid injector in the chemical liquid injection system according to claim 18, comprising:

an RFID reader for obtaining the various types of data recorded on the RFID chip; and
operation control means for performing a predetermined operation in accordance with at least some of the various types of obtained data.

32 (previously presented): A liquid warmer in the chemical liquid injection system according to claim. 30, comprising:

an RFID reader for obtaining the various types of data recorded on the RFID chip; and
operation control means for performing a predetermined operation in accordance with at least some of the various types of obtained data.

33 (withdrawn): A method of injecting a chemical liquid into a patient, comprising
providing an RFID (Radio Frequency Identification) chip mounted on a liquid syringe, said RFID chip having various types of data recorded thereon, said data including identification data for said liquid syringe, an inner diameter of a cylinder member of the syringe, and a value of pressure resistance of the liquid syringe;

mounting said liquid syringe on a chemical liquid injector, said chemical liquid injector comprising a piston member and an RFID reader for obtaining the various types of data recorded on the RFID chip;

injecting the chemical liquid into the patient, said injecting comprising moving the piston member to exert a pressure on the chemical liquid;

detecting the pressure of the chemical liquid injected into the patient by detecting a stress on the piston member and calculating an injection pressure based on the inner diameter obtained from the RFID chip and the detected stress while controlling the pressure such that the pressure

does not exceed a predetermined value of pressure resistance in accordance with at least some of the various types of obtained data;

storing predetermined check conditions including identification data of the liquid syringe;
collating the stored check conditions with the various types of data obtained from said RFID chip; and

outputting a check alarm if the identification data obtained from said RFID chip is not included in the check conditions as a result of the collation.

34 (withdrawn): A method of injecting a chemical liquid into a patient, comprising providing an RFID (Radio Frequency Identification) chip mounted on a liquid syringe, said RFID chip having various types of data recorded thereon, said data including identification data for said liquid syringe, expiration date of a liquid filled in said liquid syringe, an inner diameter of a cylinder member of the syringe, and a value of pressure resistance of the liquid syringe;

mounting said liquid syringe on a chemical liquid injector, said chemical liquid injector comprising a piston member and an RFID reader for obtaining the various types of data recorded on the RFID chip;

injecting the chemical liquid into the patient, said injecting comprising moving the piston member to exert a pressure on the chemical liquid;

detecting the pressure of the chemical liquid injected into the patient by detecting a stress on the piston member and calculating an injection pressure based on the inner diameter obtained from the RFID chip and the detected stress while controlling the pressure such that the pressure does not exceed a predetermined value of pressure resistance in accordance with at least some of the various types of obtained data;

storing predetermined check conditions including current date and time;
collating the stored check conditions with the various types of data obtained from said RFID chip; and

outputting a check alarm if the identification data obtained from said RFID chip is not included in the check conditions as a result of the collation.